

WHAT IS CLAIMED IS:

1. An apparatus including a radio frequency (RF) filter within a multilayered low temperature co-fired ceramic (LTCC) substrate, comprising:

    a first ceramic tape layer with a first electrode pattern forming a first RF ground plane;

    a second ceramic tape layer with a second electrode pattern forming a second RF ground plane;

    a third ceramic tape layer positioned between said first and second ceramic tape layers with a third electrode pattern of which at least a first portion is generally geometrically serpentine and forms a portion of a first reactance including a first inductance;

    a fourth ceramic tape layer positioned between said first and second ceramic tape layers with a fourth electrode pattern of which at least a first portion is generally geometrically serpentine and forms a portion of a second reactance including a second inductance; and

    a plurality of conductive vias coupling selected respective portions of said first, second, third and fourth electrode patterns;

wherein

    said third and fourth electrode patterns together form at least a portion of a RF bandpass filter circuit,

    corresponding sub-portions of said first portions of said third and fourth electrode patterns are mutually superimposed, and

    said first and second inductances together produce a mutual inductance which remains substantially constant substantially independently of selected variations in said mutual superimposition.

2. The apparatus of claim 1, wherein:

said first portion of said third electrode pattern includes major and minor axes;

said first portion of said fourth electrode pattern includes major and minor axes; and

said major axes are approximately mutually parallel.

3. The apparatus of claim 1, wherein

said first portion of said third electrode pattern includes major and minor axes;

said first portion of said fourth electrode pattern includes major and minor axes; and

said corresponding sub-portions of said first portions of said third and fourth electrode patterns are mutually superimposed along said minor axes.

4. The apparatus of claim 1, wherein:

second and third portions of said third electrode pattern form respective first portions of third and fourth reactances; and

second and third portions of said fourth electrode pattern form respective second portions of said third and fourth reactances.

5. The apparatus of claim 4, wherein said respective first and second portions of said third and fourth reactances together comprise first and second capacitances.

6. The apparatus of claim 4, wherein:

said second portions of said third and fourth electrode patterns and a first portion of said fourth ceramic tape layer together form a first capacitance; and

said third portions of said third and fourth electrode patterns and a second portion of said fourth ceramic tape layer together form a second capacitance.

7. The apparatus of claim 4, wherein:

    said second and third portions of said third electrode pattern comprise first and second capacitor plate electrodes; and

    said second and third portions of said fourth electrode pattern comprise third and fourth capacitor plate electrodes.

8. The apparatus of claim 7, wherein:

    each of said first, second, third and fourth capacitor plate electrodes is approximately rectangular with a corresponding major axis;

    said first and third capacitor plate electrodes are mutually superimposed and said first and third major axes are approximately orthogonal; and

    said second and fourth capacitor plate electrodes are mutually superimposed and said second and fourth major axes are approximately orthogonal.

9. The apparatus of claim 1, wherein:

    said first reactance comprises a first shunt inductance as said first inductance coupled in parallel with a first shunt capacitance; and

    said second reactance comprises a second shunt inductance as said second inductance coupled in parallel with a second shunt capacitance.

10. The apparatus of claim 9, further comprising first and second trimmable capacitances coupled in parallel with said first and second shunt capacitances, respectively.

11. An apparatus including a radio frequency (RF) filter within a multilayered low temperature co-fired ceramic (LTCC) substrate, comprising:

    a first ceramic tape layer with a first electrode pattern forming a first RF ground plane;

    a second ceramic tape layer with a second electrode pattern forming a second RF ground plane;

    a third ceramic tape layer positioned between said first and second ceramic tape layers with a third electrode pattern of which at least a first portion is generally geometrically serpentine with major and minor axes and forms a portion of a first reactance including a first inductance;

    a fourth ceramic tape layer positioned between said first and second ceramic tape layers with a fourth electrode pattern of which at least a first portion is generally geometrically serpentine with major and minor axes and forms a portion of a second reactance including a second inductance; and

    a plurality of conductive vias coupling selected respective portions of said first, second, third and fourth electrode patterns;

    wherein

        said third and fourth electrode patterns together form at least a portion of a RF bandpass filter circuit,

        said major axes of said third and fourth electrode patterns are approximately mutually parallel, and

        corresponding sub-portions of said first portions of said third and fourth electrode patterns are mutually superimposed.

12. The apparatus of claim 11, wherein said corresponding sub-portions of said first portions of said third and fourth electrode patterns are mutually superimposed along said minor axes.

13. The apparatus of claim 11, wherein:

second and third portions of said third electrode pattern form respective first portions of third and fourth reactances; and

second and third portions of said fourth electrode pattern form respective second portions of said third and fourth reactances.

14. The apparatus of claim 13, wherein said respective first and second portions of said third and fourth reactances together comprise first and second capacitances.

15. The apparatus of claim 13, wherein:

said second portions of said third and fourth electrode patterns and a first portion of said fourth ceramic tape layer together form a first capacitance; and

said third portions of said third and fourth electrode patterns and a second portion of said fourth ceramic tape layer together form a second capacitance.

16. The apparatus of claim 13, wherein:

said second and third portions of said third electrode pattern comprise first and second capacitor plate electrodes; and

said second and third portions of said fourth electrode pattern comprise third and fourth capacitor plate electrodes.

17. The apparatus of claim 16, wherein:

each of said first, second, third and fourth capacitor plate electrodes is approximately rectangular with a corresponding major axis;

said first and third capacitor plate electrodes are mutually superimposed and said first and third major axes are approximately orthogonal; and

said second and fourth capacitor plate electrodes are mutually superimposed and said second and fourth major axes are approximately orthogonal.

18. The apparatus of claim 11, wherein:

    said first reactance comprises a first shunt inductance as said first inductance coupled in parallel with a first shunt capacitance; and

    said second reactance comprises a second shunt inductance as said second inductance coupled in parallel with a second shunt capacitance.

19. The apparatus of claim 18, further comprising first and second trimmable capacitances coupled in parallel with said first and second shunt capacitances, respectively.